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Assessment of Thyroid Hormones among Sudanese Patients attending Omdurman Teaching Hospital with *Helicobacter pylori* Infection.

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Abstract

Background: One of the most common *causes* of autoimmune thyroid diseases is Hashimoto's disease, which is inflammation of the thyroid gland that reduces the secretion of thyroid hormones. An association between *Helicobacter pylori* (*H. pylori*) infection and Hashimoto thyroiditis (HT) has been reported.

Objective: To assess the concentrations of thyroid hormones: triiodothyronine (T₃), thyroxine (T₄) and thyroid-stimulating hormone (TSH) among Sudanese patients with *H. pylori* infection.

Materials and methods: This was a case-control study conducted from March to April 2018. 30 blood specimens were collected from diagnosed *H. pylori* infection patients (test group) at Omdurman Teaching Hospital. Another 30 blood specimens were collected from apparently healthy participants (control group). T₃, T₄, and TSH were measured by the automated immunoassay analyzer (TOSOH, Bioscience). Data analysis was carried out by SPSS version 21.

Results: There was a significant decrease in the concentrations of T₃ and T₄ in patients with *H. pylori* infection ($p = 0.002$ and $p = 0.029$ respectively) when compared with control participants. The (mean \pm SD) of T₃ and T₄ were $(0.097 \pm 0.45$ and 8.04 ± 2.39 ng/ml respectively) in patients with *H. pylori* infection. The (mean \pm SD) were $(1.35 \pm 0.47$ ng/ml and 9.43 ± 2.40 ng/ml) in control participants. While, there was a significant increase in the concentrations of TSH in patients with *H. pylori* infection ($p = 0.000$) when compared with control participants. The (mean \pm SD) of TSH was $(6.49 \pm 2.23$ ng/ml) in patients with *H. pylori* infection and the (mean \pm SD) of TSH was $(3.81 \pm 1.67$ ng/ml) in control participants. There was a significant negative correlation between the levels of TSH and age incidence ($R = -0.473$, $p = 0.008$); and there was no correlation between the levels of T₃ and T₄) and age incidence among test group patients.

Conclusion: The concentrations of T₃ and T₄ were low in patients with *H. pylori*; while the concentration of TSH was high in patients with *H. pylori*, suggesting primary hypothyroidism among patients with *H. pylori* infection. There was a significant negative correlation between the concentrations of TSH and age incidence among patients with *H. pylori* infection.

Keywords: Thyroid hormones, *H. pylori*, Automated immunoassay analyzer.

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Introduction

Helicobacter pylori (*H. pylori*) infection is worldwide spread with an incidence up to 50% of the population in developed countries and 80% in developing countries. The prevalence rates of the infection show a cohort effect and an increased rate usually is found in elders and males. The bacterium is a motile, gram-negative microorganism, which typically colonizes the gastric mucosa; serologically it is possible to identify the most virulent strains by the presence of the cytotoxin-associated gene A (*cagA*) antigen¹.

The bacterium is responsible of gastric diseases such as gastritis, gastric/duodenal ulcers and carcinomas. Moreover, *H. pylori* has been linked to a variety of extragastric disorders, e.g. coronary heart disease, dermatological disorders, idiopathic urticaria, autoimmune thyroid disease, and thrombocytopenic purpura. Thyroid gland is one of the important organs in the human body that produces important hormones: triiodothyronine, thyroxine, which have an important role in regulation of metabolic functions, development and growth. Thus thyroid dysfunction shall affect various vital activities and may result in hypo- or hyperthyroid gland activity due to an increase or a decrease thyroid hormones².

Thyroid autoimmunity can cause several forms of thyroiditis ranging from hypothyroidism (Hashimoto's thyroiditis) to hyperthyroidism (Graves disease). Both these disorders share many immunologic features and the disease may progress from one state to the other as the autoimmune process changes. Genetic, environmental and endogenous factors are responsible for the initiation of thyroid autoimmunity. Thyroid autoimmune is characterized by the presence of antibodies against thyroid components. Moreover, bacterial and viral antigens have been suspected to be able to mimic the antigenic profile of the thyroid cell membrane suggesting an important role in the onset of the autoimmune diseases, such as Graves disease and Hashimoto's thyroiditis³.

In addition, an association between *H. pylori* infection as environmental risk factors for Hashimoto thyroiditis (HT) has been reported. However, data regarding the relationship between *H. pylori* infection and thyroid disorders are limited in Sudanese populations, in which *H. pylori* infection is extremely prevalent.

The present study had assessed the levels of thyroid hormones among Sudanese patients with *H. pylori* infection.

Materials and methods

This was a cross-sectional, case control study conducted at Omdurman Teaching Hospital during the period from March to April 2018. Inclusion criteria include all patients presenting with *H. pylori* infection. Exclusion criteria were any individual with a past history of a disease that can affect thyroid hormones results.

The study was approved by the Scientific Research Committee of Al Neelain University. Permission to collect the specimens was granted by authorities of Omdurman Teaching Hospital. All study participants were informed with the aims of the study and its importance, and a verbal consent was obtained from each participant. Data was analyzed using the SPSS program, version 21. The results were expressed as percentages, mean, and standard deviation (SD). Independent

T-test was performed to compare the study parameters in cases versus control groups. Correlation was done to study the relationship between study parameters and study variables. A p-value less than 0.05 was considered as significant. A well-structured questionnaire was used to collect clinical and demographical data of all participants.

30 blood specimens were collected from diagnosed *H.pylori* infection patients (test group) at Omdurman Teaching Hospital. Another 30 blood specimens were collected from apparently healthy participants (control group). Blood specimens were collected from all study population, and serum was separated. The concentrations of triiodothyronine, thyroxine, and thyroid stimulating hormone were measured by the automated immunoassay analyzer (TOSOH, Bioscience). Pathological and normal control sera were included and analyzed to assure accuracy and precision of results.

Results

In this study, the (Mean ± SD) of TSH was (6.49 ± 2.23 mIU/L) in test group patients; and the (Mean ± SD) of TSH was (3.81±1.67 mIU/L) in control participants group. The (Mean ± SD) of T₃ was (0.97 ± 0.45 nmol/L) in patients with *H. pylori* infection and was (1.35 ± 0.47 nmol/L) in control participants. The (Mean ± SD) of T₄ was (8.04±2.39 nmol/L) in patients with *H. pylori* infection and was (9.43±2.40 nmol/L) in control participants.

There was a significant decrease in the concentrations of T₃ and T₄ among patients with *H. pylori* when compared with control participants (p = 0.002 and p = 0.029 respectively). While there was a significant increase in the concentration of TSH among patients with *H. pylori*, when compared with control group participants (p =0. 000).

Regarding gender incidence, insignificant association was found in the concentrations of TSH, T₃, and T₄ among male and female patients with *H. pylori* when compared with male and female control participants (p = 0.667, p = 0.917, p = 0.603 respectively). The (Mean ± SD) of TSH, T₃, and T₄ varies among males and females in patients with *H. pylori* infection and in control participants (Table 1).

Table (1): Distribution of TSH, T₃, and T₄ concentrations according to gender incidence

Parameters	Male (Mean ± SD)	Female (Mean ± SD)	p -value
TSH	6.74 ± 2.04	6.38 ± 2.37	0.667
T ₃	0.98 ± 0.61	0.96 ± 0.36	0.917
T ₄	7.71 ± 2.71	8.21 ± 2.28	0.603

Correlation studies showed a significant negative correlation between the concentrations of TSH and age incidence among patients with *H. pylori* infection (R = - 0.473, p = 0.008). On the other hand, there was no significant correlation between concentrations of T₃ and T₄ and age incidence (R = 0. 069, p = 0.719 and R = 0.016, p = 0. 934 respectively).

The correlations between the concentrations of T₃ and TSH (Fig.1) and between T₄, and TSH (Fig. 2) showed significant negative correlations.

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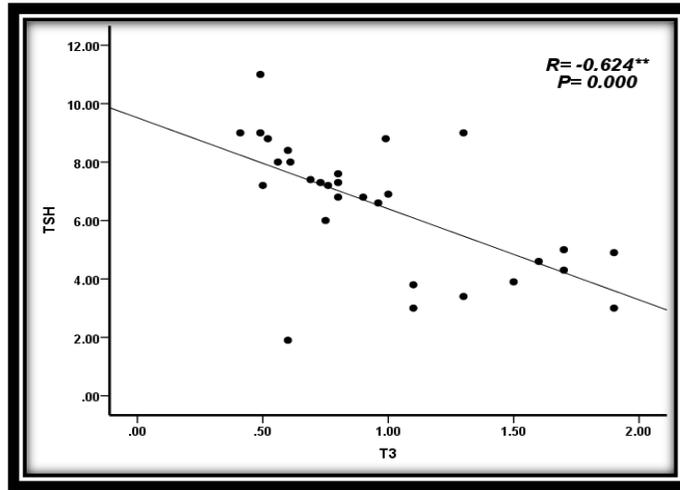


Fig. (1): Correlation between the concentrations of T₃ and TSH among test group patients

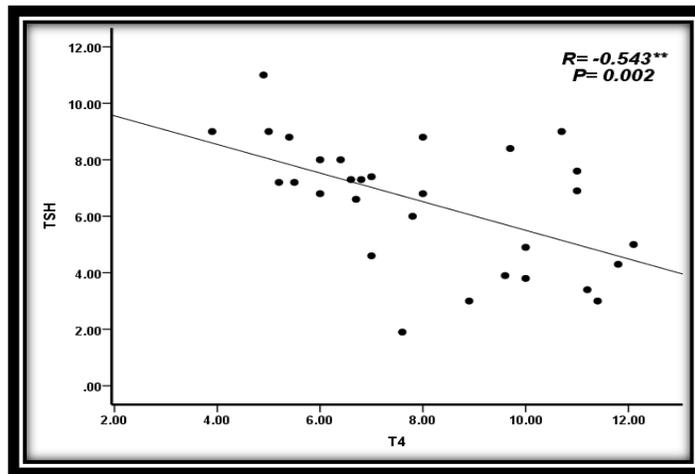


Fig. (2): Correlation between the concentrations of T₄ and TSH among test group patients

Discussion

Hashimoto thyroiditis (HT) was described over a century ago; being a chronic inflammation of the thyroid gland with undefined etio-pathogenesis. It is considered the most widespread autoimmune endocrine disorder and the most common cause of hypothyroidism. Stechova and his colleagues⁴ suggested that there may be a cross reaction between the antibodies produced during *H. pylori* infection and thyroid antigens, leading to development of autoimmune thyroid disease.

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In this study the concentrations of T₃ and T₄ showed a significant decrease in patients with *H. pylori* infection when compared with control participants (p = 0.002 and 0.029 respectively). Also, the concentrations of TSH showed a significant increase in test group patients when compared with control group participants (p = 0.000). These findings suggest a primary hypothyroidism, and thus demonstrating the presence of low levels of T₃ and T₄ among the *H. pylori* patients when compared to the control participants. These findings were close to incidence rates of the study conducted by Al-Mofarji and his co-workers⁵ who reported that, *Helicobacter pylori* incidence rate increased in the hypothyroidism patients more than in hyperthyroidism ones. This finding may indicate that *H. pylori* infection may play a role in the development of primary hypothyroidism and eventually autoimmune thyroid disease.

Regarding gender incidence, insignificant association was observed in the concentrations of T₃, T₄ and TSH among male patients with *H. pylori* infection when compared with female patients (p = 0.917, 0.603, and 0.667 respectively).

Furthermore, there was a significant negative correlation between the concentrations of TSH and age incidence (R= - 0.473, p = 0.008). However, there was no significant correlation between the concentrations of T₃ and T₄ and age incidence in test group patients.

Conclusions: The concentrations of T₃ and T₄ were low in patients with *H. pylori*; while the concentration of TSH was high in patients with *H. pylori*, suggesting primary hypothyroidism among patients with *H. pylori* infection. There was a significant negative correlation between the concentrations of TSH and age incidence among patients with *H. pylori* infection.

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